northern and the southern hemispheres. These tropical regions were uniformly characterized by distinct wet and dry seasons. It seems reasonable to suppose that the evolutionary responses of cane, a plant of tropical origin, must be closely bound up with the rainfall regimen, seasonally the most variable climatic feature of its native habitat. The relative uniformity of rainfall through the year in the Louisiana cane region is very different from the marked seasonal distribution shown for tropical areas. In Louisiana any variation from normal rainfall tending toward closer approximation to its seasonal character in the tropics is therefore favorable to cane, while that variation is unfavorable which produces or tends toward a uniformity of rainfall.

These considerations support and clarify the meaning of the high correlation found between seasonal rainfall and sugar yield in Louisiana.[2] Those years or terms of years when Louisiana rainfall most closely approximated the seasonal type of the Tropics, with accentuation of wet and dry seasons produced the best yields. In Louisiana increased rainfall during spring until June, and rainfall below normal from August through harvest, produces such an accentuation and increases yields, whereas years or periods of more uniformly wet character, or with the seasonal type reversed, reduce yields.

[2] Tengwall and van der Zyl have found, in Java, a high degree of correlation between seasonal rainfall and the yield of sugar from cane.

THE TROPICAL STORM OF AUGUST 25-26, 1926, IN SOUTHERN LOUISIANA

551.515 (763)

By R. A. DYKE

[Weather Bureau Office, New Orleans, La.]

This paper, supplementary to the regular report on warnings, New Orleans forecast district, for August, 1926, considers some aspects of the hurricane which have been brought out through further study.

Advance indications of tropical storms are usually provided by the tides and the clouds. As this storm, while in the southern part of the Gulf of Mexico, was apparently small and of moderate intensity, the advance tides were not alarmingly high on the coast. At Burrwood the tide was 0.5 foot above the predicted tide on the 23d and rose slowly during the ensuing 48 hours to a maximum 1 foot above the predicted tide at 11 a. m. of the 25th. Along the coast of Terrebonne Parish slightly higher advance tides were reported, but there are no gage readings for this section.

At Galveston the tide was 2 feet above the predicted tide in the afternoon of the 25th, or 1 foot above the highest reading of the preceding day. This was a local effect, due to the 20 to 30 mile north wind, which favored a moderate accumulation of water in the southern end of Galveston Bay, the escape of water into the Gulf being retarded somewhat by the narrowness of the passes separating the Bay from the Gulf. The moderate southeast swells also tended to increase the tide slightly.

The clouds at middle altitudes, alto-stratus and occasionally alto-cumulus, came from the south at New Orleans nearly all day on the 24th and until 1 p. m. of the 25th, when they became obscured by lower clouds from the southeast and east. During this time the direction of the middle clouds was more changeable at Pensacola and Mobile; both upper and middle clouds were occasionally observed moving from the south and also from southwest, west, and northwest. At Galveston cirrus and cirro-stratus clouds from the south and southeast prevailed during the morning of the 24th, but from westerly directions in the afternoon of the 24th, in agreement with the highest clouds over New Orleans and farther east. In the afternoon of the 25th, when the storm front was advancing to the Louisiana coast, alto-cumulus clouds at Galveston were moving from the north, directly opposite to the movement of middle clouds at New Orleans, as observed up to 1 p. m.

The movement of alto-stratus over eastern Louisiana, considerably in advance of the storm, shows an air current from the south. The northward movement of cirrus clouds over Galveston during the morning of the 24th, and over Port Arthur in the afternoon, appears to have come from the region of the storm, although east of Galveston not many observations of cirrus from the direction of the storm were obtained, the directions indicating a prevailing eastward movement at the cirrus level. The movement of cirrus from southerly directions possibly took place at a lower level than the prevailing cirrus movement from the west. Before the sky became completely overcast with lower clouds, alto-cumuli from the south were noted at Mobile in the early morning of the 25th and alto-stratus clouds from the south at Pensacola in the early afternoon. The width of the northward-moving current was not great and its thickness is unknown; but apparently there was sufficient movement to guide this relatively small hurricane in its advance to southeastern Louisiana.

In approaching the coast the storm was evidently moving north-northeast. Ship Shoal Lighthouse, latitude 28° 54′ 52″ N., longitude 91° 4′ 15″ W., was in the western part of the central calm area at 4 to 5 p. m. of the 25th, with lowest barometer reading (uncorrected) of 28.30 inches, the wind changing through north to west and increasing to hurricane force after the passage of the storm center. Soon after the center passed inland the storm curved to the northwest. The path of the center lay west of the Mississippi River, approaching it rather closely at Donaldsonville and Plaquemine (pressure of 29.16 inches at Plaquemine) and crossing the Atchafalaya River in northwestern Iberville Parish.

Among the influences tending to cause the storm to turn westward in Louisiana we may mention a rise in pressure over Tennessee and northern Alabama and Georgia in the afternoon of the 25th, which, with the relatively high pressure on the west, formed a barometric ridge extending east and west and favored a circulation of air which would tend to drag the storm westward. In an eastward-moving extratropical storm a rise in pressure in front of it has a blocking or retarding effect; in a northward-moving storm the effect appears to be as stated in the present instance, although exceptions may occur when the dominant circulation is not indicated by the surface observations.

The remarkable intensity of the storm, as indicated by the low barometer readings at Houma, compared to those at other stations, was referred to in the preliminary report. The aneroid barometers used at Houma and Morgan City have been tested at New Orleans for readings as low as 28 inches, enabling us to make necessary corrections. The pressure at Houma fell 1.32 inches in 11 hours, at an average rate of 0.12 inch an hour. From 5 p. m. to 9.30 p. m., the rate of fall was 0.32 inch an hour, about the same as that registered at New Orleans in the larger storm of September 29, 1915. Compared to the average gradient in the 50 miles between Bay St. Louis and New Orleans, in the 1915 storm 0.02 inch per mile, the average gradient between New Orleans and Houma, a distance of 48 miles, in the storm of August, 1926, was 0.023 inch per mile. On August 25, 1926, at 9.30 p. m., there was a difference of 0.66 inch between the barometer readings at Morgan City and Houma, 30 miles apart. As the storm center was slightly west of Houma, we have here a difference of at least 0.66 inch in a distance of less than 30 miles.

After passing Houma the storm decreased in intensity but retained considerable energy until it passed into St. Landry and Evangeline Parishes, where it damaged only crops. Heavy rainfall ceased with the passage of the storm center.

The previous report referred to the lack of high tides west of the center. At some points on the Louisiana coast, notably in the vicinity of Morgan City, the northeast gales on the storm front produced an unusually low tide; the lowest reading of the river gauge at Morgan City was 2.5 feet below zero at 6.45 p. m. of the 25th, about 6 feet below mean low tide. This is very remarkable, for the lowest previous river gauge reading at Morgan City was 0.2 foot above zero.

The Atchafalaya River connects with Grand Lake, a considerable body of water immediately northwest of Morgan City, and with the Gulf to the south, of which the nearest coast line is at right angles to a northeast offshore wind. This wind, blowing with hurricane force, lowered the water along the coast, particularly on the north side of Atchafalaya Bay, where the river empties into the Gulf, and may also have checked the rate of flow from Grand Lake into the river. When the wind backed to northwest, between midnight and 1 a. m. of the 26th, the water in the Gulf, relieved of the unusual strain, began to return to the north and east sides of Atchafalaya Bay, increasing the height of water in the river. A small peninsula, Point au Fer, extends westward from the Terrebonne coast and with westerly gales favors some accumulation of water at the mouth of the Atchafalaya. Simultaneously the northwest gale on Grand Lake increased the flow from that source. The resulting rise of 7.3 feet brought the river back to slightly more than the usual stage in about six hours.

Radiophone broadcasting and reception made possible a better distribution of warnings than in previous storms. In view of the intensity of the hurricane, the large number of people engaged in fishing and other coast industries, and the very slight elevation of the swampy areas in southern Terrebonne Parish, where the storm was most violent, the loss of life, 25 persons, is considered small. Reports of property loss and damage due to the storm are not all in; but trustworthy information indicates that property damage of all kinds, exclusive of crops in the field, was between $3,000,000 and $4,000,000 and that damage to crops will reach an equal or somewhat higher figure.

PERSISTENCE OF WEATHER TYPES IN THE HAWAIIAN ISLANDS

551.515 (969)

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An inspection of a chart showing mean annual temperatures for a series of years in temperate latitudes does not disclose any tendency to a progressive warming or cooling. On the other hand, in the Tropics this tendency has been frequently noted, particularly by Henry (*1*) and Braak (*2*) for Batavia, Java. In tropical regions the variability of temperature and pressure is very slight, hence any systematic influence affecting these elements, such as sunspots or volcanic acivity, would be much more noticeable in these regions than in temperate latitudes, where variability is great and of accidental or fortuitous nature.

Clough (*3*) has shown by various statistical methods that the sequence of temperature changes from year to year do not follow the laws of chance variations.

In the United States there is a certain amount of persistence of temperature departures from month to month and year to year which is most strongly pronounced in central and southern California. Rainfall and atmospheric pressure do not show as much tendency to persist, but where large areas are taken into consideration there is some tendency of rainfall to persist from month to month during the summer season, at least in some sections.

In order to obtain an idea as to just what tendency there is for one month to be followed by a month of the same temperature sign in the United States, this was computed for 10 representative stations. The percentage of cases ranged from 65 at San Diego to 54 at Salt Lake City. Over eastern United States the result was quite uniform with an average of about 56 per cent, and the tendency toward persistence was greatest during late summer and the least during middle spring, the extreme monthly range averaging 10 per cent.

The persistence tendency probably varies somewhat with the length of record, and with a period of a hundred years or more it can be clearly shown that there is a relation between one month and the same month of the year in the succeeding years. This has been done with the St. Paul, Minn., record covering a period of 105 years, and the result is shown in Table 1. An inspection of this table offers very little encouragement to one who is looking for the effects of periodicities. For example, in the 11-year sunspot period if it were very strong there would be a well-marked positive correlation between months 11 years apart, and a negative correlation between months of about half this period. There is, however, a slight positive correlation shown in the table between months 11 or 12 years apart which is the most noticeable for the winter months.

TABLE 1.—*Percentage of times in which one month has the same temperature sign as the same month of the year during each of the following years up to 16, for St. Paul, Minn.*

Month	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eighth year	Ninth year	Tenth year	Eleventh year	Twelfth year	Thirteenth year	Fourteenth year	Fifteenth year	Sixteenth year
January	51	48	56	50	44	48	58	47	55	55	52	49	59	42	39	44
February	55	50	49	43	47	51	43	53	52	56	59	60	51	49	47	43
March	62	57	57	56	51	46	56	53	59	58	57	54	59	51	42	52
April	53	55	45	46	55	51	59	45	59	47	49	58	51	56	53	52
May	63	49	49	43	52	48	50	53	49	49	47	39	38	46	52	55
June	64	58	47	44	51	47	49	53	51	60	57	58	60	57	59	55
July	59	61	43	56	49	54	54	45	49	43	52	51	53	41	40	49
August	60	52	57	62	61	51	54	51	42	40	40	51	42	36	47	50
September	59	45	50	57	49	46	51	54	43	40	53	59	56	40	51	51
October	50	60	49	52	47	51	46	55	51	53	49	56	51	46	49	53
November	64	59	54	52	55	49	51	48	52	49	50	51	50	48	47	54
December	54	44	47	50	57	48	50	58	41	47	51	47	49	48	52	57
Means	58	53	50	51	52	49	52	51	50	50	51	53	52	47	48	51
Winter means	53	47	51	51	49	49	50	53	49	53	54	52	53	46	46	48
Summer means	61	57	49	54	54	51	52	50	47	48	50	53	52	45	49	51